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TO: Larry Schnaubelt/B.Lowery  
Product Manager #74  
Reregistration and Special Review Division (H7508C)

FROM: Emil Regelman, Supervisory Chemist  
Environmental Chemistry Review Section #2  
Environmental Fate and Ground Water Branch, EFED (H7507C)

THRU: Henry M. Jacoby, Chief  
Environmental Fate and Ground Water Branch, EFED (H7507C)

Attached, please find the EFGWB review of:

Reg./File #: 239-1633

Common Name: Naled

Chemical Name: 1,2-Dibromo-2,2-dichloroethyl dimethyl phosphate

Type product: Insecticide/Acaricide

Product Name: Dibrom

Company Name: Chevron Chemical Company

Purpose: Review submitted studies for reregistration of naled; review  
supplemental data requested in EFGWB review dated 5/19/88;  
indicate status of data requirements for NALED

Date Received: a) 5/16/88 a) 90-0220  
b) 12/1/89 EFGWB #: b) 90-0279

Action Code: 660 Total Reviewing Time (decimal days): 7.0

Deferrals to: \_\_\_\_\_ Ecological Effects Branch, EFED  
\_\_\_\_\_ Science Integration & Policy Staff, EFED  
\_\_\_\_\_ Non-Dietary Exposure Branch, HED  
\_\_\_\_\_ Dietary Exposure Branch, HED  
\_\_\_\_\_ Toxicology Branch I, HED  
\_\_\_\_\_ Toxicology Branch II, HED

1. CHEMICAL:

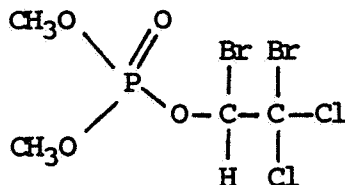
Common name: Naled

Chemical name: 1,2-Dibromo-2,2-dichloroethyl dimethyl phosphate

CAS #: 300-76-5

Trade name(s): Dibrom, Bromex, RE 4355

Structure:



Formulations: 3-6% D; 7-15% Impr.; 2-7.2 lb/gal and 2.5-58% EC;  
12.6 lb/gal and 1.2-20% SC/L; 1.26-3.34 lb/gal and  
0.66-15% RTU

Physical/Chemical Properties:

Molecular weight: 348.6

Physical state: Yellow liquid, slightly pungent odor

Vapor pressure:  $2 \times 10^{-3}$  Torr

Solubility:

Water.....practically insoluble

Highly soluble in.....aromatic and chlorinated  
hydrocarbons; ketones; alcohols

Sparingly soluble in.....petroleum solvents  
mineral oils

2. STUDY/ACTION TYPE:

- Review new studies submitted towards reregistration of naled
- Review supplemental data requested in EFGWB review of 5/19/88
- Indicate the current status of data requirements for NALED.

3. STUDY IDENTIFICATION:

a. New studies (Photodegradation),

MRID #41310702

- Chen, Y.S. 1989. Photodegradation of [1-ethyl-<sup>14</sup>C]-naled in water. Laboratory Project ID MEF-0129/8915401. Unpublished study performed and submitted by Chevron Chemical Co. Richmond, CA.

MRID #41310701

McGovern, P.A., Shepler, K. and Ruzo, L.O. 1989. Soil surface photolysis of [<sup>14</sup>C]naled in natural sunlight. Laboratory Project ID 130W. Unpublished study performed by Pharmacology and Toxicology Research Laboratory, Richmond, CA. Submitted by Chevron Chemical Company, Richmond, CA.

MRID #41310703

McGovern, P.A., Shepler, K., and Ruzo, L.O. 1989. Vapor phase photolysis of [<sup>14</sup>C]naled in natural sunlight. Laboratory Project ID PTRL Report No. 136W-1. Unpublished study performed by Pharmacology and Toxicology Research Laboratory-West, Richmond, CA. Submitted by Chevron Chemical Company, Richmond, CA.

b. New studies (Volatility),

MRID #41310704

Kesterson, A., Jackson, S., and Lawrence, L.J. 1989. Laboratory volatility of [<sup>14</sup>C]naled (Dibrom) from a surface of sandy soil. Laboratory Project ID Report No. 1215, Project 339, Chevron: MMF-0130. Unpublished study performed by Pharmacology and Toxicology Research Laboratory, Lexington, KY. Submitted by Chevron Chemical Company, Richmond, CA.

c. Anaerobic aquatic metabolism studies that were not reviewed on 5/19/88 because relevant data was missing. Supplemental data was submitted and is included in the presesnt review,

MRID #40580001

Pack, D.E. and Fry, C.E. 1988. Anaerobic aquatic metabolism of [ethyl-1-<sup>14</sup>C]naled. Laboratory Project ID MEF-0012/8716931. Unpublished study performed and submitted by Chevron Chemical Company, Richmond, CA.

MRID #40618201

Pack D.E and Fry, C.E. 1988. Anaerobic aquatic metabolism of [ethyl-1-<sup>14</sup>C]naled- Revised Report. Laboratory Project ID MEF-0012/8809272. Unpublished study performed and submitted by Chevron Chemical Company, Richmond, CA.

MRID #41354102

Pack, D.E. and Fry, C.E. 1988. Supplement to "Anaerobic aquatic metabolism of [ethyl-1-<sup>14</sup>C]naled". Laboratory Project ID-MEF-0012/8716931. Unpublished study performed and submitted by Chevron Chemical Company, Richmond, CA.

d. Supplemental data requested in the EFGWB review dated 5/19/88,

MRID #41354101

Chen, Y.S. Supplement to "Hydrolysis Products of (Ethyl-1-<sup>14</sup>C)naled in Buffer Solutions". (Original study 40034902)

MRID #41354103

Pack, D.E. Supplement to "The Aerobic Aquatic Metabolism of (Ethyl-1-<sup>14</sup>C) Naled. (Original study ID #001620-99).

MRID #41354104

Pack, D.E. Supplement to "Soil Column Leaching of (Ethyl-1-<sup>14</sup>C) Naled (DIBROM)". (Original study ID #00161100).

MRID #41354105

Pack, D.E. Supplement to "Estimation of Soil Adsorption Coefficient of NALED from TLC Data". (Original study ID #40279200).

MRID #41354106

Pack, D.E. Supplement to "Freundlich Adsorption Isotherms of Dichloroacetic Acid". (Original study ID #40394904).

MRID #41354108

Selman, F. and Williams, M. Supplement to "Dissipation Study on DIBROM 14 CONCENTRATE for Forestry Uses. (Original study ID #40304301).

MRID #41354109

Cheng, H.M. Supplement to "NALED Accumulation Study- Rotational Crops (Confined). (Original study ID #40034905).

e. Aquatic field dissipation studies

MRID #40494101

Lee, S-L. 1988. Aquatic field dissipation of Dibrom. Laboratory Project ID R196T71178. Unpublished study prepared and submitted by Chevron Chemical company, Richmond, CA.

MRID #41354107

Lee, S-L. 1988. Supplement to "Aquatic field dissipation of Dibrom". Laboratory Project ID R196T71178. Unpublished study prepared and submitted by Chevron Chemical Company, Richmond, CA.

MRID #40976401

Hacker, L.A. 1987. LX182-03 (Dibrom <sup>14</sup>C) field dissipation- aquatic pond study in Mississippi. Laboratory Project ID 1642-87-82-03-19B-19. Unpublished results prepared by Landis Associates, Inc., Valdosta, GA. Submitted by Chevron Chemical Company, Richmond, CA.

MRID #409764402

Hacker, L.A. 1987. LX182-03 (Dibrom <sup>14</sup>C) Field dissipation-aquatic pond study in Florida. Laboratory Project ID 1642-87-82-03-19B-18. Unpublished study prepared by Landis Associates, Inc., Valdosta, GA. Submitted by Chevron Chemical Company, Richmond, CA.

f. Other studies,

Accession #154125

Fujie, G.H. 1984. Naled hydrolysis in aqueous solutions. Study Project ID Number 721.2. Performed and submitted by Chevron Chemical Company, Richmond, CA.

4. REVIEWED BY:

Silvia C. Termes, Chemist  
Review Section #2  
OPP/EFED/EFGWB

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

5. APPROVED BY:

Emil Regelman  
Supervisory Chemist  
Review Section #2  
OPP/EFED/EFGWB

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

6. CONCLUSIONS:

- a. Hydrolysis studies- Data requirements for this type of study have been considered fulfilled with the supplemental information contained in MRID #41354101 (original study reviewed on 5/19/88; MRID #40034902).

The other hydrolysis study (Fujie, Accession No. 154125) was already reviewed in 1986 (8/5/86) and was considered unacceptable.

Summary of data:

The hydrolytic degradation of naled is a pH-dependent in which the rate of degradation increases with increasing pH. The half-lives of hydrolysis in buffered solutions and 25 C were:

pH 5.....96 hrs  
pH 7.....15.4 hrs  
pH 9.....1.6 hrs

Two different reaction mechanisms take place at pH 9 and at pH 5, which give rise to different predominant degradates. The main degradate at pH 9 is "desmethyl naled". The main degradation product at pH 5 is bromodichloro acetaldehyde (BDCA), which implies that at pH 5 cleavage of the P-O bond and elimination of the C-2 bromine is the predominant mechanism. At pH 7 both mechanisms (demethylation and P-O cleavage/C-2 Br elimination) take place. There was no evidence of DDVP formation at any of the three pHs studied.

b. Photodegradation studies (in water, on soil, in air),

None of these studies fulfill data requirements at the present time. Additional information is being requested for each of these studies. If the information requested is not found acceptable, then new studies may be required.

c. Anaerobic and aerobic aquatic metabolism studies

- The reviewed anaerobic aquatic metabolism study (40580001, original study; 40618201, Revised Report; Supplement 41354102) was considered to provide supplemental information only. The results of the study indicate that parent naled can undergo rapid degradation under anaerobic aquatic conditions (reported half-life <1-day). However, the lack of frequent sampling during the first day after treatment and the difficulty in obtaining adequate immediate posttreatment sample analyses do not provide a satisfactory pattern of formation/decline of degradates during the first day after treatment. After one day posttreatment, only ca. 15% parent naled was detected. The main degradates after one day were DDVP, DCE, and DCAA, with minor amounts of desmethyl-DDVP. Evolution of carbon dioxide increased with time.

EFGWB will not be requesting a new anaerobic aquatic metabolism study at this time, but if future concerns arise about degradate formation (particularly of DDVP) during the first day after application a new study may be required. Therefore, the need for a new anaerobic aquatic metabolism study is being reserved at this time.

- The aerobic aquatic metabolism study is still considered unacceptable. In the submitted Supplement the registrant provided a new material balance table in which the information from volatile  $^{14}\text{C}$  and that of  $^{14}\text{C}$  remaining in the soil and in water was combined. However, the percent of total recovered radioactivity is still considered low (78-92%). The volatile  $^{14}\text{C}$  was attributed to formation of  $^{14}\text{CO}_2$ . The low recoveries may be associated to loss of other more volatile products or to inefficient trapping. Provisions to identified other volatiles or to improve trapping efficiency should have been made.

Therefore, a new aerobic aquatic metabolism study is required, for which frequent sampling during the first and second days is recommended. Because of the rapid degradation of naled, it may not be necessary to carry on these studies beyond two-weeks after application. Purpose of new studies: better determination of reaction pathways.

d. Mobility in soil studies

With the additional information requested in the 5/19/90, this data requirement can be considered fulfilled.

- Based on soil thin-layer chromatography data, parent naled was slightly mobile in four soils while the degradate DDVP was moderately mobile,

<u>SOIL</u>	<u>Parent NALED</u>		<u>DDVP</u>	
	<u>R<sub>f</sub></u>	<u>K<sub>d</sub></u>	<u>R<sub>f</sub></u>	<u>K<sub>d</sub></u>
Blendon sandy loam (pH 5.6; 1.4% OM)	0.35.....	1.3	0.71.....	0.3
Nicolett clay loam (pH 7.0; 0.7% OM)	0.16.....	3.6	0.46.....	0.8
Oakley loamy sand (pH 7.3; 1.4% OM)	0.28.....	1.8	0.66.....	0.3
Stockton adobe clay (pH 4.5; 2.4% OM)	0.16.....	3.6	0.37.....	1.2

- Aged (0.4-3.0 hrs) radiolabeled naled residues were mobile in columns of sand (pH 6.7; 1.9% OM), clay loam (pH 8.1; 2.8% OM), sandy loam (pH 7.1; 1.0% OM) and two loam soils (one of pH 5.5 and 1.5% OM; the other of pH 7.2 and 0.8% OM). The amount of applied radioactivity remaining in the columns ranged between 5.4-10.98% of the applied while 36.20-58.50% was in the leachates. Residues were very mobile in the sand soil column; 2.71% of the radioactivity remained in the soil column and 66.68% was in the leachates.

In general, radioactivity remaining in the soil was evenly distributed throughout the columns. No significant parent naled was detected in the leachates ( $\leq 0.02$  ppm); DDVP was  $\leq 0.093$  ppm; dichloroethanol (DCE) was  $\leq 0.085$  ppm, dichloroacetic acid (DCAA) was  $\leq 1.863$  ppm, and "carbonate" was  $\leq 0.282$  ppm.

COMMENT:

The mobility data indicate that the nonvolatile degradates of naled are more mobile in soil than the parent pesticide and therefore, have a higher potential to leach.

e. Volatility study (laboratory)

This study does not fulfill data requirements at the present time. Additional information is being requested.

f. Aquatic field dissipation studies

The reviewed studies can be used to fulfill data requirements for aquatic field dissipation studies. The studies provide information



on the aquatic dissipation of the SC/L formulation of naled in two ponds (FL and MS) at application rates of  $\leq 0.4$  lb ai/A/application.

However, an additional study will be needed with the D formulation at two sites. In order to support uses at higher application rates (for example on rice, which has a maximum application rate of 0.675 lb ai/A), an additional aquatic field dissipation study at this higher maximum application rate may be needed.

Data Summary:

Naled dissipated with a half-life of  $<1$  day in pond water treated with naled (85% SC/L) by five aerial applications at 0.4 lb ai/A per application during a two-week period to ponds in Florida and Mississippi. DDVP was isolated in the pond water at maximum concentrations of 0.013-0.014 ppm at the FL and MS sites. Following the last application, DDVP ( $<0.001$  ppm) after 7 days. Naled and DDVP were not detected in sediment samples.

g. Forestry dissipation,

Data requirements for forestry dissipation studies have considered fulfilled with the additional information/clarification provided by the registrant.

Data Summary:

The dissipation of naled in a forestry environment occurs very fast (half-life ca. 1-day). The higher concentrations of naled/DDVP were in the top of the canopy. In stream and pond water the concentrations of naled/DDVP were  $<5$  ppb (0, 1, 3 days posttreatment) and  $<50$  ppb in exposed and litter-covered soil (0-3 and 3-6 inch depths; 0, 1, 3, and 5 days posttreatment).

h. Accumulation in confined rotational crops

The supplemental information provided by the registrant has been considered adequate. Therefore, data requirements for this type of study has been fulfilled.

However, it must be pointed out that this study was conducted at an application rate of 2 lb ai/A. According to the 1987 Use Index, the only sites treated at application rates  $>2$  lb ai/A are orchard sites. Therefore, as long as no field treated at application rates  $>2$  lb ai/A is rotated/intercropped, this study is acceptable to fulfill data requirements for rotational crops at application rates  $<2$  lb ai/A.

Data Summary:

$^{14}\text{C}$ -naled residues were  $\leq 0.03$  ppm (naled equivalents) in mature lettuce (tops and roots), wheat (grain, bran, and straw), and carrots (tops and roots) planted in plastic pots (14-in in diameter; 18-in depth) of loam soil (48% sand, 40% silt, 12% clay; pH 7.2; 0.8% OM), 30 days

after the soil surface was treated with ethyl [1-<sup>14</sup>C]naled at a nominal application rate of 2 lb ai/A. Naled residues were 0.07 ppm in wheat roots.

<sup>14</sup>C-naled residues in soil were 0.52 ppm at time 0, 0.03 ppm at 30-days (planting time), and 0.01 ppm at crop harvest (3-4 month posttreatment). The study was conducted in a greenhouse maintained on a 14-hr, 80F: 10 hr, 70 F light-dark cycle.

The rapid degradation of naled and DDVP and the fact that these materials can be readily metabolized to CO<sub>2</sub> indicate that there is not a large potential for naled residues to accumulate in rotational crops in soil treated with naled.

- i. In 1986 Chevron had requested a waiver for the study on accumulation in irrigated crops (165-3). However, because there was no data on the dissipation of naled in aquatic fields, this waiver was not granted in 1986. Data requirements for aquatic field dissipation studies are now considered fulfilled for uses at application rates ≤0.4 lb ai/A per application. Therefore, a waiver for 165-3 can be granted at this time for application rates ≤0.4 lb ai/A per application (see CONCLUSIONS for aquatic field dissipation studies).
- j. Spray drift studies are required and have been requested by the Agency. The registrant must submit these studies within the time frame set by the Reregistration Branch in 1989.

#### STATUS OF DATA REQUIREMENTS AFTER THE PRESENT REVIEW

A Table summarizing the status of environmental fate data requirements for naled is attached to this review.

#### ENVIRONMENTAL FATE ASSESSMENT OF NALED

No integrated environmental fate assessment for NALED is included at this time.

#### 7. RECOMMENDATIONS:

The registrant should be informed of the following:

- a. The data requirements for the hydrolysis (161-1), mobility in soils (163-1), aquatic field dissipation (164-2), forestry dissipation (164-3) and accumulation in confined rotational crops (165-1) have been fulfilled. However, the registrant should be made aware that additional aquatic field dissipation studies are still required with other formulations. Studies to support higher application rates may be required (see CONCLUSIONS).

The registrant should also be made aware of the comments in the CONCLUSIONS section about the accumulation in rotational crops study.

- b. Additional data is being requested for the three photodegradation studies and for the volatility from soil study. These comments appear in the pertinent DER. Copies of all DERs should be made available to the registrant.

- c. The anaerobic aquatic metabolism study is considered to provide supplemental information. EFGWB is not requiring a new study at this time (see CONCLUSIONS section). This requirement is being reserved.

Note that an acceptable anaerobic aquatic metabolism study may be used to fulfill the data requirements for anaerobic soil metabolism studies, which is still unfulfilled. Therefore, the reviewed anaerobic aquatic metabolism study may be used to obtain supplemental information for the anaerobic soil metabolism study. No new anaerobic soil metabolism study is required at this time.

- d. The aerobic aquatic metabolism study does not fulfill data requirements. Complete copy of the DER should be made available to the registrant. A new study is required. See CONCLUSIONS section.

- e. A waiver has been granted for the study on accumulation in irrigated crops (see CONCLUSIONS section).

- f. Spray drift studies (201-1 and 202-1) are still data gaps.

## 8. BACKGROUND:

### a. Introduction

On 5/19/88 data submitted in response to the 6/30/83 Registration Standard were reviewed by EFGWB. Additional information or new studies were requested in the 5/19/88.

This information and new studies have been submitted by the registrant and their in-depth review has been requested by the Reregistration Branch as part of the reregistration process for "List A Chemicals".

The results of the in-depth review and a summary of the current status of data requirements are included in this review.

### b. Directions for use

Naled is a nonsystemic insecticide-acaricide registered for use on terrestrial food crop (field, vegetable, and orchard crops), terrestrial

nonfood (live-stock and poultry and their surroundings), greenhouse food crop, greenhouse nonfood, domestic outdoor (urban and rural outdoor areas for mosquito control), aquatic food crop, aquatic nonfood, forestry, and indoor (agricultural, domestic, medical, and commercial establishments) use sites. Naled is applied using aircraft and ground equipment including mist sprayers and foggers.

10. DISCUSSION OF INDIVIDUAL STUDIES:

Data Evaluation Records are attached to this review for the following studies: photodegradation (in water, on soil, and in air), anaerobic aquatic metabolism (including the supplement), volatility from soil, and aquatic field dissipation (including the supplement). The evaluation of the supplemental information submitted for the hydrolysis, mobility in soil, forestry dissipation, and accumulation in confined rotational crops studies are also attached, but the review of the original studies appear in the 5/19/88 review.

11. COMPLETION OF ONE-LINER: One-liner has been updated with fulfilled data.

12. CBI APPENDIX: No CBI.

STATUS OF DATA REQUIREMENTS FOR NALED

<u>Data Requirement</u>	<u>Status</u>	<u>Pertinent study ID #</u>
161-1 Hydrolysis	Fulfilled	40034902; 41354101 (Supplement)
161-2 Photodegradation in water	Additional information being requested	41310702
161-3 Photodegradation on soil	Additional data being requested	41310701
161-4 Photodegradation in air	Additional data being requested	41310703
162-1 Metabolism in soil- Aerobic	Fulfilled	00085408
162-2 Metabolism in soil- Anaerobic	See 162-3	See 162-3
162-3 Aquatic metabolism- Anaerobic	Supplemental information Reserved. No new studt required at the present time	40618201; 41354102 (Supplement)
162-4 Aquatic metabolism- Aerobic	Not fulfilled New study required	-

# STATUS OF DATA REQUIREMENTS FOR NALED

(Continued)

<u>Data Requirement</u>	<u>Status</u>	<u>Pertinent Study ID #</u>
163-1 Mobility in soil	Fulfilled	Original studies: 00161100 40279200 40394904 Supplements: 41354104 41354105 41354106
163-1 Volatility from soil- Laboratory	Additional data being requested	41310704
163-2 Volatility from soil- Field	Trigger by results of laboratory study	-

STATUS OF DATA REQUIREMENT FOR NALED

(Continued)

<u>Data Requirement</u>	<u>Status</u>	<u>Pertinent Study ID #</u>
164-1 Terrestrial Field Dissipation-----	Waiver granted on 8/5/86 based on the very rapid degradation	
164-2 Aquatic Field Dissipation	Fulfilled for application rates ≤ 4 lb ai/A (Soluble Concentrate)	40494101; 41354107 40976401; 40976402
	Study needed (two sites) to support registration of D formulation	
164-3 Forestry dissipation	Fulfilled	40304301; 41354108
164-4 Dissipation- Combination and tank mixes-----	-----Not being imposed at the present time	
164-5 Long-Term Terrestrial Field Dissipation -----	-----Not required (waiver granted for 164-1)	

# STATUS OF DATA REQUIREMENTS FOR NALED

(Continued)

<u>Data Requirement</u>	<u>Status</u>	<u>Pertinent study ID #</u>
165-1 Accumulation in confined rotational crops	Fulfilled for application rates $\leq 2$ lb ai/A	40034905; 41354109
165-2 Accumulation in rotational crops- Field	Not required based on the results of 164-1	
165-3 Accumulation in irrigated crops	Requested waiver can be granted based acceptable aquatic field dissipation studies, provided naled is used at an application rate $\leq 0.4$ lb ai/A/application	
165-4 Accumulation in fish	Satisfied (waived)	
165-5 Accumulation in aquatic non-target organism	Satisfied (waived)	
<u>New studies required:</u>		
201-1 Spray Drift-----Droplet Spectrum		Not received
202-1 Spray Drift-----Drift Field Evaluation		